

Topic: The Application of Computer Visualization on Wearable Device

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Research purpose:

We want to create a simple wearable device which can be worn by children. Through the device, we can ensure the safety of children (for example the device can identify the face of bad guy) by using the technique of face identification.

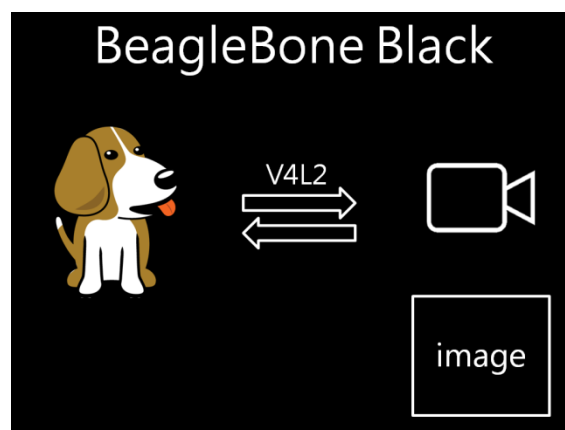
Overview:

The project can be separated into three parts: the client side (camera) to catch images, the connection side (cell phone) to transmit the data and provide Wi-Fi to another two sides, and the server side to do face identification on PC. When the camera catches an image, it would transmit to the connection side through Wi-Fi, and the picture would transmit to the server side. The server side would detect the person's face and frame the person's face with a red block (if there isn't a person's face, this procedure would end) and compare the face with the data which is already stored in the database. If the face can match the data, then it will show the name beside the red block; otherwise it would not show the data.

Summary:

All the data is transmitted by socket.

● client side (camera)

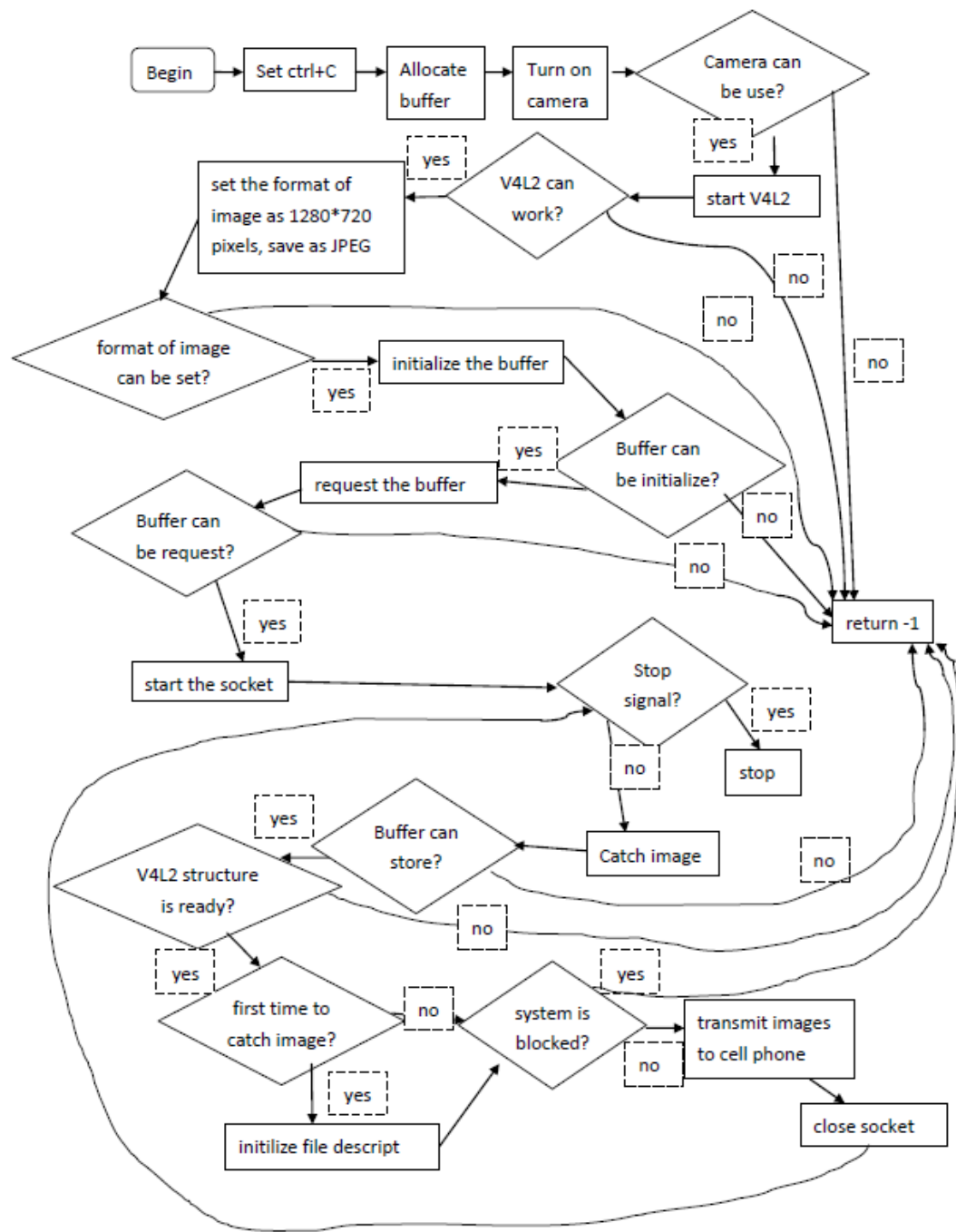


The camera catches the image continually, then transmits it to the cell phone directly. This side is developed by using a microcamera, BeagleBone Black board, C++, V4L2 structure, and OpenCV library.

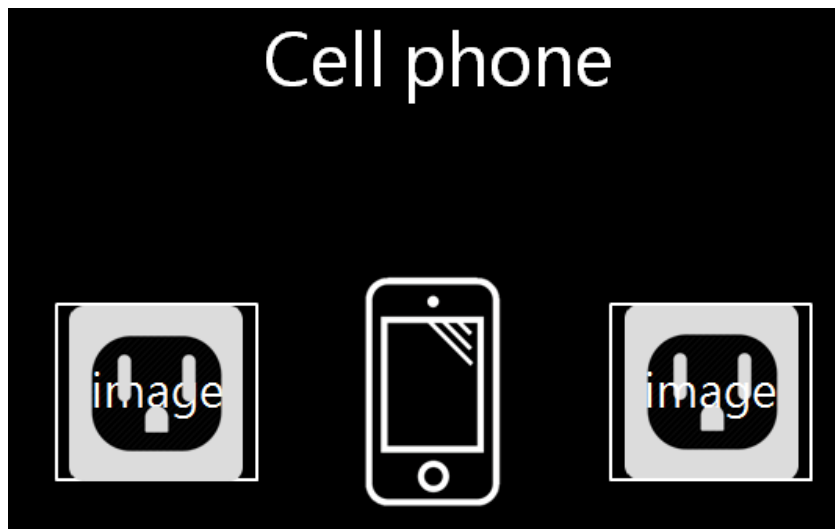
At first, set the stop signal (ctrl+c), and allocate the buffer to store the images. Then turn on the camera and start V4L2 structure which connects BeagleBone

black board and camera. And set the format of image as 1280*720 pixels, save as JPEG. Next, initialize the buffer, and request the data of buffer. And then, start the socket so the beaglebone black board and camera connect with each other. When the preparation finished, camera then start to catch and transmit the image. Without the stop signal, camera will do the mission above continually.

If microcamera and V4L2 structure are fail to start, or format of image can't be set, or buffer can't be allocate and fail to request, the program would unable to work, it will return -1 directly.

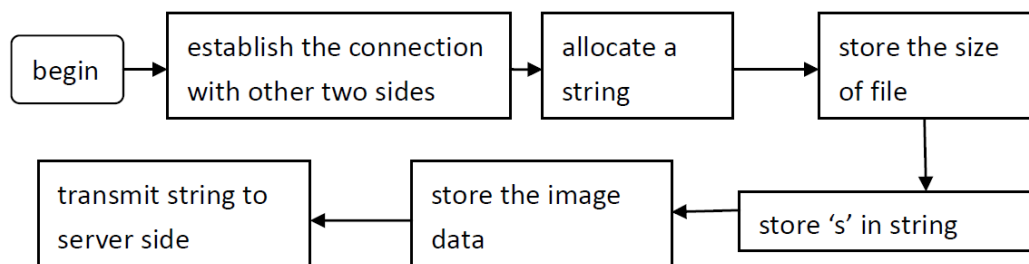


●connection side (cell phone)

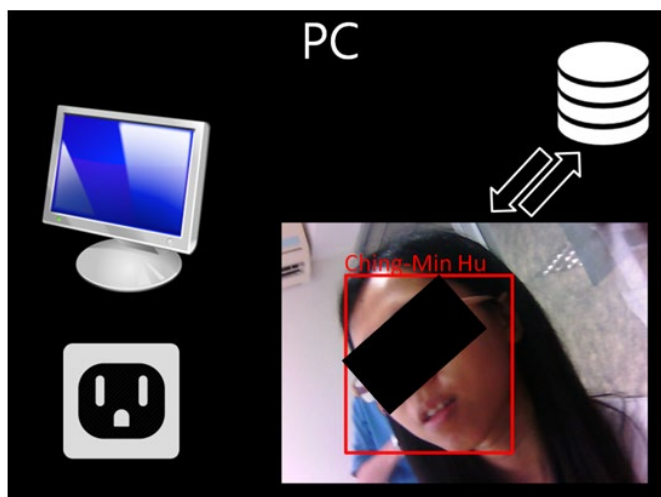


Cell phone provides the Wi-Fi to client side and server side. This part is developed by JAVA through android system.

First, establish the connection with other two sides. Then allocate a string to store data. Then store the size of file which receive from client side, and store 's' after the size number as a separate element, then store the image data. Finally transmit this string to server side.

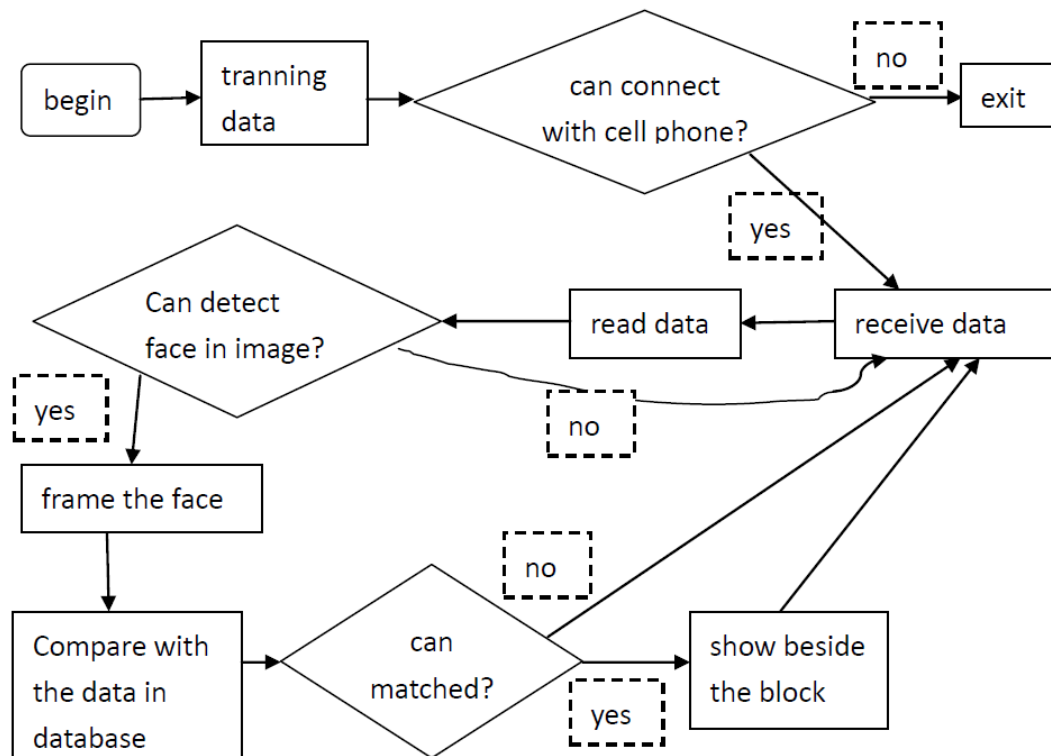


●server side (PC)



The task of PC is to detect and identify human's face. This part is developed by C++ and opencv library through linux system.

First, training the data to get the data from database, and connect with cell phone. After getting the image, then program will detection if there're human's face in the picture or not. If not, the program would receive data; otherwise the face would frame by red block and compare with the data in database. If the face can be matched, the name would show beside the block.



Difficulties and solutions:

1. At first, the speed of transmission between client side and cell phone is low because cell phone receive the data by using while loop byte by byte. At last change to receive many bytes, then the problem solved.
2. The speed of catch image by camera and the processing of PC is not synchronized, so the delay will become longer and longer when catch many images (the system is blocked). At last we change to let PC limit the buffer to store at most 5 images, and the time of delay can maintain in certain period.